

AMENDMENTS TO THE CLAIMS

1. (currently amended) A process for preparing a BGG glass material comprising the steps of

(a) melting BGG glass components at a melting temperature, said components consisting essentially of comprising barium oxide (BaO) and/or barium carbonate (BaCO_3), gallium oxide (Ga_2O_3), germanium oxide (GeO_2), or a precursor thereof, and a halogen component at a temperature above liquidus temperature of the BGG glass to form a BGG glass melt. ~~melt~~; wherein amounts of the BGG glass components are in the BGG glass forming region: bubbling said BGG glass components with a dry gas during said melting step;

(b) quickly cooling the BGG glass melt to avoid crystallization to below glass transition temperature of the BGG glass to form a BGG glass;

(c) annealing the BGG glass at a temperature above the glass transition temperature but below crystallization temperature: and

~~(d)~~ slowly cooling the BGG glass after annealing to a temperature below the glass transition temperature to form the BGG glass material, wherein said BGG glass material has a transmission level of at least 80% over the wavelength range from about 0.5 micrometers to about 5 micrometers.

2. (original) The process of claim 1 including the step of fining the BGG glass melt at about the glass melting temperature.

3. (original) The process of claim 2 wherein the halogen component is selected from the group consisting of halogen gases, halide compounds and mixtures thereof.

4. (original) The process of claim 3 wherein the melting temperature is about 1300°C, the liquidus temperature is about 1150°C, the crystallization temperature is about 800°C, and the glass transition temperature is about 675°C.

5. (original) The process of claim 4 wherein the step of fining is conducted for a period of about one hour to remove bubbles from the glass melt and the glass melt is rapidly cooled from about the melting temperature to about the room temperature at which the BGG glass melt is in solid state and then heating the BGG glass from about room temperature to about 700°C for annealing for a period of several hours to remove at least some of the stresses caused by the rapid cooling step.

6. (original) The process of claim 5 wherein the rapid cooling step is conducted at a rate on the order of about 50°C per minute and wherein the slow cooling step is conducted at a rate on the order of about 1°C per minute.

7. (original) The process of claim 3 including the step of adding rubidium oxide (Rb_2O) and/or cesium oxide (Cs_2O) to the BGG glass components in order to introduce rubidium ions and/or cesium ions into the BGG glass material.

8. (original) The process of claim 7 including the step of ion exchanging cesium ions for rubidium ions.

9. (original) The process of claim 2 wherein the halogen component is selected from the group consisting of barium chloride (BaCl_2), rubidium chloride (RbCl), cesium chloride (CsCl), and mixtures thereof.

10. (original) The process of claim 2 wherein amount of germanium oxide is 35-90 mole %, amount of gallium oxide is 0.1-25 mole %, amount of barium oxide and/or barium carbonate is 0.1-50 mole %, and amount of the halogen component is 0.1-20 mole %, and wherein the BGG glass components include 0-50 mole % cesium oxide and 0-50 mole % rubidium oxide.

11. (original) The process of claim 7 wherein amount of germanium oxide is 40-60 mole %, amount of gallium oxide is 10-18 mole %, amount of barium oxide and/or barium carbonate is 20-45 %, amount of cesium oxide is 0-40 mole %, amount of rubidium oxide is 0-40 mole %, and amount of the halogen component is 1-10 mole %.

12. (original) The process of claim 11 wherein the halogen component is selected from the group consisting of barium chloride, rubidium chloride, cesium chloride and mixtures thereof.

13. (original) The process of claim 3 including the step of adding seed material during the melting step to form crystals within the BGG glass material, nucleating the seed material at a nucleating temperature which is below the melting temperature and growing the crystals at a temperature above the nucleating temperature before the slow cooling step.

14. (original) The process of claim 13 including the step of mixing the BGG glass components below the melting temperature.

15. (original) The process of claim 13 wherein duration of said nucleating and said crystal growth steps is about one hour.

16. (original) The process of claim 14 wherein duration of said nucleating and crystal growth steps is about one hour.

17. (original) The process of claim 13 including the steps of cooling at a rate on the order of about 5°C per minute after said crystal growth step down to near the glass transition temperature, holding at about the glass transition temperature to equalize inside and outside temperature, then cooling at a rate on the order of about 1°C per minute.

18. (currently amended) A BGG glass material having less than 1 part per million hydroxyl ions ~~made from consisting essentially of, on mole percent basis:~~

(a) germanium oxide (GeO_2) having a concentration of about 35 mole percent to about 90 mole percent;_____35-90

(b) gallium oxide (Ga_2O_3)_____0.1-25 having a concentration of about 0.1 mole percent to about 25 mole percent;

~~(c)~~ barium oxide (BaO) and/or barium carbonate (BaCO_3)—~~0.1-50~~ having a concentration of about 0.1 mole percent to about 50 mole percent;

~~(d)~~ cesium oxide (Cs_2O) ————— ~~0-50~~ having a concentration of about 0 mole percent to about 50 mole percent;

~~(e)~~ rubidium oxide (Rb_2O) ————— ~~0-50~~ having a concentration of about 0 mole percent to about 50 mole percent; and

~~(f)~~ a halogen component ————— ~~0.1-20~~ having a concentration of about 0.1 mole percent to about 20 mole percent, wherein said BGG glass material has a transmission level of at least 80% over the wavelength range from about 0.5 micrometers to about 5 micrometers.

19. (currently amended) A BGG glass material consisting essentially of ~~made from~~ on mole % basis:

~~(a)~~ germanium oxide (GeO_2) ————— ~~40-60~~ having a concentration of about 40 mole percent to about 60 mole percent;

~~(b)~~ gallium oxide (Ga_2O_3) ————— ~~10-18~~ having a concentration of about 10 mole percent to about 18 mole percent;

~~(c)~~ barium oxide (BaO) and/or barium carbonate (BaCO_3)—~~20-45~~ having a concentration of about 20 mole percent to about 45 mole percent;

~~(d)~~ cesium oxide (Cs_2O) ————— ~~0-40~~ having a concentration of about 0 mole percent to about 40 mole percent;

- (e) rubidium oxide (Rb_2O) ————— 0-40 having a concentration of about 0 mole percent to about 40 mole percent; and
- (f) a halogen component ————— 1-10 having a concentration of about 1 mole percent to about 10 mole percent, wherein said BGG glass material has a transmission level of at least 80% over the wavelength range from about 0.5 micrometers to about 5 micrometers.

20. (previously amended) The BGG glass material of claim 18 wherein said halogen component is selected from the group consisting of barium chloride, rubidium chloride, cesium chloride and mixtures thereof.

21. (previously presented) The BGG glass material of claim 19 wherein said halogen component is selected from the group consisting of barium chloride, rubidium chloride, cesium chloride and mixtures thereof.

22. (canceled) The process of Claim 1 further comprising the step of bubbling said BGG glass melt with a dry gas during said melting step.

23. (currently amended) The process of Claim 22 1 wherein said dry gas is Ar/O_2 .

24. (new) An article of manufacture comprising a BGG glass material consisting essentially of germanium oxide (GeO_2) having a concentration of about 40 mole percent to about 60 mole percent:

gallium oxide (Ga_2O_3) having a concentration of about 10 mole percent to about 18 mole percent:

barium oxide (BaO) and/or barium carbonate (BaCO_3) having a concentration of about 20 mole percent to about 45 mole percent;

cesium oxide (Cs_2O) having a concentration of about 0 mole percent to about 40 mole percent;

rubidium oxide (Rb_2O) having a concentration of about 0 mole percent to about 40 mole percent; and

a halogen component having a concentration of about 1 mole percent to about 10 mole percent, wherein said BGG glass material has a transmission level of at least 80% over the wavelength range from about 0.5 micrometers to about 5 micrometers.

25. The article of manufacture of Claim 24, wherein said article is a window.

26. The article of manufacture of Claim 24, wherein said article is a dome.